

promulgated by Prof. Huxley in 1867, and so to bring out many points of special interest in avian cranial osteology, demonstrating most clearly the principle which may be arrived at from the study of any special organ or single structure, that a fact which is of the greatest significance in determining the relationships of some one collection of species or genera, may be valueless in attempting to classify others. As an instance of this we may take the skull of the woodpeckers and wrynecks, the peculiarities of which have led Mr. Parker to place them in a division by themselves of primary importance, whereas there is nothing more certain than that their differences from the Toucans and Capitonidae are only just sufficient to separate them as a family from either. And yet among almost all other orders of birds the cranial structure is invaluable in the determination of their affinities.

The uniformity of the nomenclature and the absence of any laxity in the expression of the mutual relations of parts, greatly increases the facility with which the great number of facts brought forward by the authors can be grasped, and no doubt it is Mr. Bettany whom we have in great measure to thank for the general selection and classification of those which have been chosen to form "The Morphology of the Skull."

In conclusion we feel certain that all who read the work under consideration, the very nature of which makes it almost impossible for us to discuss the details with reference to any of the points which it brings forward, will realise how important an addition it is to biological science, and no thinking student will lay it down without recognising how much scope there is for still further investigation in the same field, especially in that direction which leads to the explanation of the reason why cartilages grow and bones form in certain definite directions and situations and in them alone; in other words, the next book of the kind required is one on the dynamics of the development of the skull.

THOMSON'S "SIZING OF COTTON GOODS"
The Sizing of Cotton Goods. By Wm. Thomson. (Manchester: Palmer and Howe.)

IN weaving cotton cloth it is necessary that the warp, which has to withstand a considerable strain in the process of manufacture, should be artificially strengthened by "sizing," that is, by dressing the thread with some adhesive material so as to enable it to resist the pulling and wearing action of the healds and shuttle. In the earlier days of cotton manufacture the weaver contented himself with the use of a mixture of flour-paste and tallow; the first ingredient gave the thread the desired extra strength, the second removed the harshness which the use of flour alone would have given. But the manufacturer soon discovered that by a judicious selection of the components of his "size," and by alterations in the mode of applying it, he could confer upon the cloth the appearance of being fuller and stouter than it actually was, judging from the amount of cotton contained in it. The great scarcity of the raw material during the cotton famine which sprung out of the American civil war had a powerful effect in developing the ingenuity of a certain set of manufacturers, and there is no doubt that their machinations have had a lasting influence upon the mode of manufacture of grey

cloth. As the weight of a piece of calico is one of the chief elements in determining its value, attempts were quickly made to increase that weight by mixing such bodies as powdered heavy-spar, or, worse still, of deliquescent salts like the chlorides of magnesium and calcium, with the sizing material. Occasionally the manufacturer in thus attempting to palm off water or a worthless mineral in lieu of good cotton over-reached himself and a just retribution overtook him in the shape of heavy damages for mildewed or rotten goods.

The results of many of these attempts afford excellent illustrations of the proverbial danger of a little knowledge; the manufacturer somehow acquired the information that chloride of calcium, an almost worthless bye-product in many chemical operations, was an excellent absorbent of atmospheric moisture; its advantages as an ingredient of the sizing mixture were therefore obvious; unfortunately he knew nothing of *oidium oranteacum* or *puccinia graminis*, and had probably never heard of *pencillum glaucum*, or he might have known that he was preparing a mixture specially suited to the development of these fungi. Silicate of soda or water-glass doubtless appeared at first sight to be an excellent substance for dressing warp, but a painful experience was needed to teach some manufacturers that these alkaline silicates rapidly absorb carbonic acid, and that the resultant products, namely, free silica, and sodium carbonate, together occupying a larger volume than the original silicate, exerted a disruptive action upon the hollow cotton-fibre and made the cloth rotten and useless. Mr. Thomson does not altogether shirk the consideration of the moral aspects of the question of sizing; he makes no secret of the fact that the operation is often done with fraudulent intention. He expresses his opinion distinctly enough that the introduction of an undue amount of size into goods intended for the home trade can serve no useful purpose, but we think he will find it difficult to convince ordinary or unbiased people that a composition consisting, to the extent of half its weight, of a mixture of putrid flour, or British gum, China clay, barytes, or magnesium chloride, tallow, or palm-oil, with a sufficient amount of chloride of zinc or carbolic acid to prevent the whole from running into absolute nastiness, is a fit material to clothe even the patient Hindoo or the prudent Chinaman. Mr. Thomson, however, takes this business of sizing as a fact which, of course, cannot be ignored, and he tries to make the best of it. In the outset he shows that, as it now stands, the process is one of the clumsiest, most unscientific, and least understood of all the operations with which the manufacturer has to deal, and he points out, clearly and concisely, wherein it is faulty, and how it may be amended.

The book is, of course, designed primarily for the use of grey-cloth manufacturers, calico-printers, and generally of those whose business it is to buy and sell calico; and the subject is mainly treated from the point of view of a chemist perfectly familiar with the objects sought to be gained by legitimate sizing. In plain and albeit scientific language he describes the various pieces of apparatus employed in ascertaining the value of the different ingredients in size; he points out the qualities, good and bad, of the materials employed to give adhesive and softening qualities to the size; how the

size is to be applied to the yarn ; to what diseases or modes of decomposition it is liable ; and how it may be preserved from mildew or mischievous changes. The book has every right to be regarded as the only important treatise on the subject which has yet appeared, and, as such, we would recommend it to all who are interested in the production of one of our chief staples. T.

OUR BOOK SHELF

Physiological Tables for the Use of Students. Compiled by Edward B. Aveling, D.Sc., F.L.S. (London : Hamilton, Adams, and Co.)

WE are at a loss to find any excuse for the publication of these tables, which no one, we presume, would attempt to justify except on the plea that they may be useful in cramming students so as to pass the multifarious superficial examinations which are a blot upon our educational system.

They are unphilosophical in their plan, and altogether unreliable in their details. Some idea of the nature and value of the information which is here put up, as it were, into separate pigeon-holes for the use of the unwary, may be gathered from the following quotations. Nervous tissue, we are told, contains 15 per cent. of fats, thus classified :—

Fats, 15 per cent. in white, { Oleo-phosphoric acid.
5 per cent. in gray. Olein ; margarin ; palmitin.
 Cholesterin.

Would Dr. Aveling like to write a short essay upon oleo-phosphoric acid? Has he never heard of such bodies as glycerin-phosphoric acid and its derivative lecithin?

Or to quote from Table IV., where Dr. Aveling writes on the causes of the circulation :—

CAUSES OF CIRCULATION.	Impulse of heart.	1. Alterations in diameter of capillaries. 2. Alterations of velocity of blood flowing through them. 3. Movement of blood after excision of heart in cold-blooded animals. 4. Emptying of arteries after death. 5. Secretion after death. 6. First movement of blood in embryo towards, not from, the heart. 7. Fetus without heart has organs developed. 8. Degeneration of heart during life without much alteration in the circulation. 9. Heart working well, and yet circulation through some part ceases. 10. Asphyxia.
	Elasticity of arteries. Capillary Force. Proofs. . . .	
	Muscular pressure on veins.	

Would it not be an admirable exercise to set the above lines to intending candidates in physiology and ask them to criticise them? Our readers will do so for themselves.

In the table referring to the sense organs we are confidently told that the nerve centres for the special sense of touch are the *thalami optici*, that the centres of the special sense of smell are the olfactory lobes, that the centres of sight are the corpora quadrigemina, the corpora geniculata, and the *thalami optici*.

But the above examples are more than sufficient to prove how dangerous a catalogue of mistakes Dr. Aveling has presented us with.

If science is to be used as a discipline in education, let it be fully and accurately taught ; let us not imitate the old scholastic routine which forced unpalatable jargon in the form of " *propria quae maribus*," &c., upon the unwilling student, and refuse to follow it in that which is its merit—its accuracy.

A. G.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

Indium in British Blends

IT will be a matter of some interest to English mineralogists and chemists to know that certain blends of Durham and, I believe, of Cumberland contain Indium in appreciable quantities. This fact has been made out by a very skilfully-conducted analysis by Dr. Flight in the laboratory attached to this department.

The work in the laboratory has, through the past two years, been almost exclusively devoted to the analysis of minerals selected from the division of the collection which is in process of being catalogued, and for which the crystallographic work has long been in progress.

When I gave the particular blends in question to Dr. Flight for analysis, the grounds for their selection were that they were British, and that one of them in particular resembled certain foreign blends which contain the rare metals found in association with this mineral.

The object of this letter is to secure a prompt announcement of Dr. Flight's having found Indium in the blonde in question. He will in due time communicate further details of the analysis of the blonde and of an elegant process by which he at once separates the Indium Sulphide from the blonde.

NEVIL STORY MASKELYNE
Mineral Department, British Museum, October 30

The Radiometer and its Lessons

WILL you allow me to make a few remarks in reply to Dr. Carpenter's letter on "The Radiometer and its Lessons," published in the last number of NATURE, and to try to show that I had good grounds for the opinion I expressed at the late meeting of the British Association in reference to his article on the same subject in the *Nineteenth Century*?

Nearly the whole of the first three columns of Dr. Carpenter's letter is devoted to proving that he "was not influenced, when writing on the radiometer, by any *animus* arising from [his] personal antagonism to Mr. Crookes on another subject." As I never in any way charged him with being thus influenced, I do not think that this part of his letter calls for any further remark on my part than an expression of my sincere regret that it should have been possible for him to think that I intended to make such a charge.

Dr. Carpenter devotes the rest of his letter to showing that he had "adequate justification" for "making it appear that Mr. Crookes had put a wrong interpretation on his own results," and thus proves very conclusively that I had "adequate justification" for supposing it possible that he may have intended to make this appear in his article in the *Nineteenth Century*.

In order to make out his "justification," Dr. Carpenter sets himself to prove (1) that Mr. Crookes puts forward the "direct impact of the waves" as affording "a definite interpretation" of the motion of the radiometer, and (2) that he claimed "the discovery of a 'new force' or 'a new mode of force.'"

With regard to the first of these points, I think that few persons can have read or heard Mr. Crookes's accounts of his investigations without having observed how careful he was to reserve his judgment as to the cause of the remarkable effects he had discovered, and neither to give out as conclusive any explanation of his own, nor to adopt any of those suggested by others until, chiefly through his own further experiments, one of them had been shown to rest on sufficient evidence. It is true that on one occasion he uses the following words (quoted by Dr. Carpenter) :—" My own impression is that the repulsion accompanying radiation is directly due to the impact of the waves on the surface of the moving mass, and not secondarily through the intervention of air-currents, electricity, or evaporation and condensation," and that, in several places in his earlier papers, he shows a leaning towards the same hypothesis ; but this is a very different thing from having adopted this view as a "definite interpretation" of the phenomena. Even Dr. Carpenter does not attempt to show that Mr. Crookes ever, in so many words, committed himself to this theory, but concludes that he held it